15, 16 and 17 added are herewith submitted as are copies with the changes highlighted in red. A terminal disclaimer signed by the undersigned attorney of record will be filed to overcome the Examiner's rejections of claims 1, 2, 4, 5, and 10 once a claim is allowed that conflicts with Applicant's issued patent 6,761,372.

The Examiner has rejected claims 1 through 5, 8 and 10 under 35 U. S. C. 102 on Hickman 4,574,707,herein after the '707 patent. The '707 patent disclosure is cited by the Examiner with reference to the teachings of the array of spring 135 column 7, lines 2 to 4 and coaxial tension spring 136 in column 8, lines 15 through 17. At the bottom of column 7 and in most of column 8 there is described the mounting, purpose and use of this specifically named in '707, "SECOND STAGE SPRING SUSPENSION" as not for highway service but only for railroad service. This is a significant difference as the railroad service for which the springs 136 are intended is not and can not be for Applicant's claimed rebound control apparatus or method.

Applicant has amended the claims to specifically recite rebound control in reaction to road surface, cornering and braking of autos, trucks or sport utility vehicles. The claimed rebound control method and apparatus are not disclosed or appreciated in '707 as herein after carefully explained with citation of specific portions relevant to Applicant's claims.

From column 8 of '707 with emphasis on the most pertinent parts in italics and larger font the highway suspension is explained and distinguished from that cited by the Examiner.

> "The reason for this is that in highway service the helical springs 60 of the highway truck G serve only to carry a part of the highway load. The other part of the highway load is carried by the highway tractor (not shown). However, in railroad service each railroad truck F carries the entire load of each cargo body A. Accordingly, about twice as much resilient resistance is required in railroad service, half of this being supplied by the arrays of first stage springs 60, and the other half being supplied by the array of second stage springs 135."

The preceding describes railroad service and continues in column 8 of '707 after the aforementioned:

> "These second stage helical compression springs 135 are in two spaced rows, one under each of the cross bolsters 48. *They are suspended from these cross bolsters, but are maintained under a degree of compression by helical tension springs 136 severally contained therein.* A bottom plate 138 is arranged under and supports each row of second stage springs 135. On each bottom plate is welded a row of cups 139 which severally seat the bottoms of the helical compresson springs 135. The tops of these helical compression springs 135 are severally contained in caps 140 which can be welded to the underside of a horizontal plate 141. This plate has parallel upright walls 142 which fit and are welded to the opposing sides of the cross bolsters 48 of the highway frame G. The plate 141 can be reinforced by suitable gussets 143 and 144."

The Examiner's attention is directed to '707 figures 9, 10 and 10A wherein the depending relationship of the springs 135 and 136 are shown. In column 8 of '707 the following appears and is instructive of the construction, operation and nature of those spring arrays.

> "In highway service, the array of secondary compression springs 135 merely go along for the ride as shown in FIG. 9. They bear downwardly against the bottom plates 138 which are suspended from the highway truck frame by the tension springs."
>
> "However they become effective when the cargo containers A are coupled together in a train for railroad service. In such coupling, the bottom plates 138 of the two rows of helical compression springs 135 automatically position themselves directly above the cross bolsters 48 and pillow blocks 86 of the preceding cargo container A. As the front end of the cargo container A is being lowered to couple the hole 128 in its front tongue 117 onto the pin 129 (FIGS. 11 and 12) of the forward cargo container A, the plates 138 automatically drop onto the pillow blocks 86 and cross bolsters 48 of the preceding cargo container A. Such seating is insured by upright positioning guide fingers 151 welded to the sides of the cross bolsters 85."

For specifics on total lack of any apparatus or method for rebound control by use of the Second Stage Suspension System cited by the Examiner (that is disclosed as used only for railroad service) in '707 see column 11, line 61 to column 12, line 10 reproduced below with emphasis as before.

> "At the same time, such lifting force *cannot be permitted to result in wheel hop or possible derailment*. To this end each railroad wheel exerts a minimum downward pressure on its track. This is provided by its resilient rubber rollers 103 pressing downwardly on its journal box 93. To this end the downward force of the resilient rollers 103 is greater than the upward force of the companion resilient pad 101."

> "These elastic rollers 103 are shaped to have a constant resilient rate of deflection in supporting substantially the entire maximum load, such deflection not greatly exceeding an inch under maximum static load. Their action is as a stabilizer means *to insure that all of the railroad wheels are under constant pressure with the rails at all times*. The dynamic action of these elastic rolls 103 is near zero so they do not have any springing action, as part of the main spring suspension, in suspending the load."

Springs 136 can not have any rebound control as their influence is for securing or holding of the load springs 135 prior to railroad service. Springs 136 are not for suspension purposes as they are entirely inactive not merely for highway service but also for railroad use indeed during any travel springs 136 are not mounted or operated in any method, as urged by the Examiner, for rebound control as claimed by Applicant. Any other interpretation is simply not possible because springs 136 never receive any rebound activity when in railroad use as such motion would derail the train wheels also in highway service springs 135 and load springs 135 are inactive and mounted so they are not at all in use.

Consequently, patent '707 teaches no apparatus or method for rebound control and so can not provide any increasing force during rebound control. Therefore, Amended claims 1, 21 through 29 are patentable over '707. Specifically, with regard to resisting roll per method claim 29, '707 is without any rebound control and thus, '707 can not have Applicant's claimed steps of exerting increasing force against rebound motion or resisting sprung weight with motion of unsprung weight during rebound.

All that is further confirmed in '707 in column 13, lines 29 through 40 wherein the construction and use of the second stage springs 135 and 136 are explicitly disclosed as follows with emphasis:

> "*In highway service, the second stage helical springs 135 merely go along for the ride*. They ride, as best shown in FIG. 7, on the bottom plates 138 suspended from the bottom of the highway trunk C by the helical tension springs 136. *As the highway truck G, and its cargo container A, are being dropped onto their railroad truck F, these bottom plates 138 engage and fit onto the pillow blocks 86 welded to the cross I-beams of the frame of the railroad truck F. They are, of course, compressed and serve as the resilient support for that part of the load that is carried by the highway tractor (not shown) in road service.*"

With further respect to the teaching in '707 of the intended use of spring 136, '707 states very clearly that each is to retain its respective load spring 135 prior to load application via pillow block 86 when the walking beams are suspended from highway frame G before being placed upon and in nesting relationship with its particular railroad truck F. See for specifics '707 column 5 lines 27 to 36 below.

> "The frame of the railroad truck F comprises essentially two main longitudinal side frame beams 80 which are of I-beam form in cross section. The central parts 81 of these side frame beams are depressed and are connected to their higher end parts 82 by inclined portions 83 which converge downwardly toward each other and provide top wedge faces 84 which snugly fit the upwardly diverging wedge faces 32 of the highway frame walking beams when the highway and railroad frames G and F are brought into mating or nesting relation."

Applicant has corrected the drawings as suggested by the Examiner. Applicant has amended the independent claims to distinguish them from the cited railroad second stage suspension system which is used only to interface between the railroad truck or dolly and the trailer walking beam. Applicant has renumbered the claims as requested by the Examiner. Claims 25, 26 and 28 have been withdrawn by the Examiner even though claim 21 is generic with respect to each of them.

Should there be any questions, the Examiner is encouraged to call or email the Applicant's undersigned attorney.

Respectfully submitted on behalf of Applicant for reconsideration,

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1. A vehicle suspension system for use on road and off road placed between a chassis for autos, sport utility vehicles or trucks having a sprung weight and a plurality of wheel axle supports each carrying a portion of an unsprung weight, the suspension system for road travel comprising:

a resilient load bolster mounted between the chassis and the wheel axle support to carry the chassis at a ride height relative to the wheel axle support, and a resilient member for rebound control resulting from vehicle transients or road conditions affixed between each wheel axle support and the chassis for exerting increasing force there between as a function of the amount of rebound motion of the sprung weight away from the wheel axle support, the resilient member mounted between the chassis and the wheel axle support for initiating application of force caused by reaction to road surface, cornering and braking during jounce motion for transition from loading beyond the ride height.

~~2~~ 21. A vehicle suspension system for use on road and off road placed between a chassis for autos, sport utility vehicles or trucks having a sprung weight and each of a plurality of wheel axle supports carrying unsprung weight, the vehicle suspension system at least operative to independently control motion between the chassis and each wheel axle support during jounce and rebound, the vehicle suspension system including a plurality of load springs having an elastic constant, each load spring located between the chassis and its respective wheel axle support, each of the plurality of respective load springs for supporting the sprung weight of the chassis carried there on at a ride height relative to its respective wheel axle support and for substantially carrying the sprung weight during jounce motion of the chassis, each of the respective load springs mounted to the chassis for flexing between the chassis and its respective wheel axle support for resisting motion of the chassis sprung weight under load and during jounce, the vehicle suspension system for road travel comprising:

a rebound control spring for rebound control resulting from vehicle transients or road conditions mounted to the chassis and each wheel axle support for exerting increasing force to its respective wheel axle support during rebound motion of the sprung weight of the chassis away from its respective wheel axle support, each

rebound control spring operatively mounted in opposition to its respective load spring for increasing resistance to chassis sprung weight rebound motion and to initiate the application of resistance to rebound motion of the chassis by transfer of the unsprung weight of each respective wheel axle support through each rebound control spring to the chassis upon motion of the sprung weight away from its respective wheel axle support, each respective rebound control spring mounted to oppose the jounce motion of the load spring to provide a transition between the end of jounce motion and the beginning of rebound motion as the rebound motion of the chassis sprung weight caused by reaction to road surface, cornering and braking is resisted by its respective wheel axle support.

~~3~~ 22. The suspension system of claim 21 wherein the rebound control spring is elastic to stretch sufficiently between the chassis and its wheel axle support even when the load spring is compressed to its maximum load capacity.

~~4~~ 23. The suspension system of claim 21 wherein therein the chassis has a substantially rectangular footprint having four wheels disposed generally to carry the corners thereof with each corner having its wheel axle support moveably carried by its respective load spring and its respective rebound spring to resist jounce and rebound at each corner respectively.

~~5~~ 24. The suspension system of claim 21 wherein each of the respective rebound control springs includes a coil spring having sufficient jounce and rebound motions to maintain connection with the chassis and its respective wheel axle support even when its respective load spring is compressed to its maximum load position during jounce.

Withdrawn ~~6~~ 25. The suspension system of claim 5 wherein each load spring is a coil coaxial with a load spring axis disposed between the chassis and each respective wheel axle support, each coil load spring having a concentric volume defined thereby and located there within and each respective rebound control spring disposed within the concentric volume for movement therein without binding with the coil load spring during jounce, rebound and transition.

Withdrawn ~~7~~ 26. The suspension system of claim 5 wherein each load spring is coaxial with a load spring axis disposed between the chassis and each

respective wheel axle support, and each rebound control spring is spaced apart from the load spring along a tension spring axis generally parallel to the load spring axis of each coil load spring as each rebound control spring moves relative to its respective coil load spring during jounce, rebound and transition.

~~8~~ 27. The suspension system of claim 2 wherein the rebound control spring is mounted to the chassis and its respective wheel axle support for elastically tethering between the chassis and its respective wheel axle support to maintain connection there between even when the load spring is beyond its maximum load capacity.

Withdrawn ~~9~~ 28. The suspension system of claim 2 wherein the rebound control spring is a torsion spring with torque preloaded sufficiently between the chassis and the wheel axle support to maintain connection there between even when the load spring is beyond its maximum load capacity.

~~10~~ 29. A method of resisting roll with a vehicle for use on road and off road with a suspension system placed between a chassis for autos, sport utility vehicles or trucks having a sprung weight and a plurality of wheel axle supports each carrying a portion of an unsprung weight, the vehicle suspension system operative along a line of travel between the chassis and the wheel axle support during jounce and rebound, the method having steps comprising:

applying loads to the wheel axle support with a resilient load bolster having an elastic constant K, the resilient load bolster mounted to the chassis;

flexing the resilient load bolster with respect to the wheel axle support with movement along the line of travel under load and during jounce;

carrying with the resilient load bolster when preloaded the chassis at a preset ride height relative to the wheel axle support;

connecting a suspension platform to the wheel axle support;

attaching the suspension platform for bearing against the resilient load bolster;

reciprocating the suspension platform for along the line of travel during jounce and rebound;

attaching a resilient member for rebound control resulting from vehicle transients or road conditions the resilient member having an elastic constant K_T to the

suspension platform and to the chassis for exerting increasing force on the chassis along the line of travel and against the rebound motion of the sprung weight of the chassis

applying increasingly less rebound force to the resilient load bolster during jounce through and beyond the preset ride height as the resilient member resists the rebound motion of sprung weight away from the wheel axle support;

operating the resilient member in opposition to the resilient load bolster;

resisting the rebound motion of the sprung weight with motion of the unsprung weight during rebound of the unsprung weight away from the chassis, and

mounting the resilient member to oppose at least the initiation of jounce for acting in opposition to the resilient load bolster with the resilient member resisting rebound motion of the chassis away from the wheel axle support caused by reaction to road surface, cornering and braking.

Figure 10 is a schematic view of a strut suspension assembly with opposed springs like that of Figure 9.

Figure 11 is a side view of the opposed spring suspension having air-bag compression and coil tension springs mounted side by side on a wheel axle support.

Figure 12 shows schematically four wheel one at each corner of the chassis whereat the suspension of the invention may be located.

DETAILED DESCRIPTION OF THE INVENTION

A vehicle spring system 10 is schematically shown in Figure 1 placed between a chassis having a sprung weight 11 and a plurality of wheel axle supports 12 each carrying a portion of an unsprung weight 13. As used through this disclosure the term chassis 11 refers to that which is carried by each of the one or more the wheel axle supports 12 as sprung weight. The meanings of the terms "chassis and/or body" or "chassis/body" in the originally filed application are the parts of the vehicle that ride on the springs so the weight thereof is carried. Those combined terms seek to cover vehicles with separate frames, those with unitized bodies and those constructed with a unitized body with or without front and rear sub frames to carry the axles. An opposed spring system 14 includes a resilient load bolster 15 such as for example a coil, air, elastic, torsion or leaf spring, Figures 3 to 11. The resilient load bolster 15 mounts between the chassis 11 and the wheel axle support 12 to carry, when preloaded; the chassis 11 at a preset ride height relative to the wheel axle support 12, see coil springs in Figures 3 through 11. A resilient member ~~15~~ <u>16</u> such as tension or compression air or coil springs elastic restraints are mounted affixed between each wheel axle support 12 and the chassis 11, Figures 3 to 11. The particular resilient member 16 exerts increasing force there between as a function of the amount of motion of the unsprung weight 13 relative to the chassis 11.

Illustrated on the graph of Figure 2 the relative opposing spring effects of the resilient load bolster 15 and the resilient member 16 are shown with respect to a typical compression load supporting suspension between points H and J as a

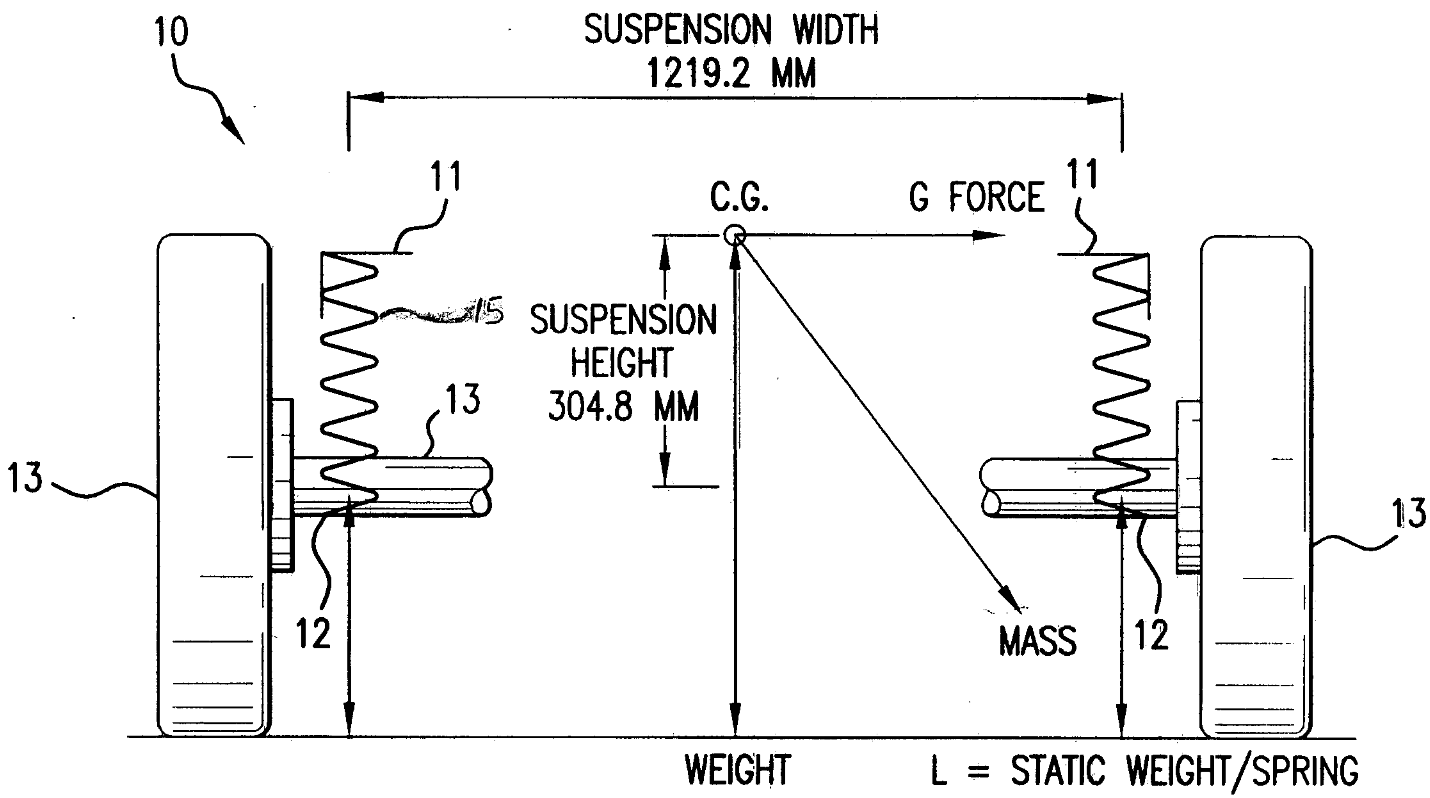
10
SUSPENSION WIDTH
1219.2 MM
11
C.G.
G FORCE
11
15
SUSPENSION
HEIGHT
304.8 MM
13
13
13
12
MASS
12
WEIGHT
L = STATIC WEIGHT/SPRING

FIG.1

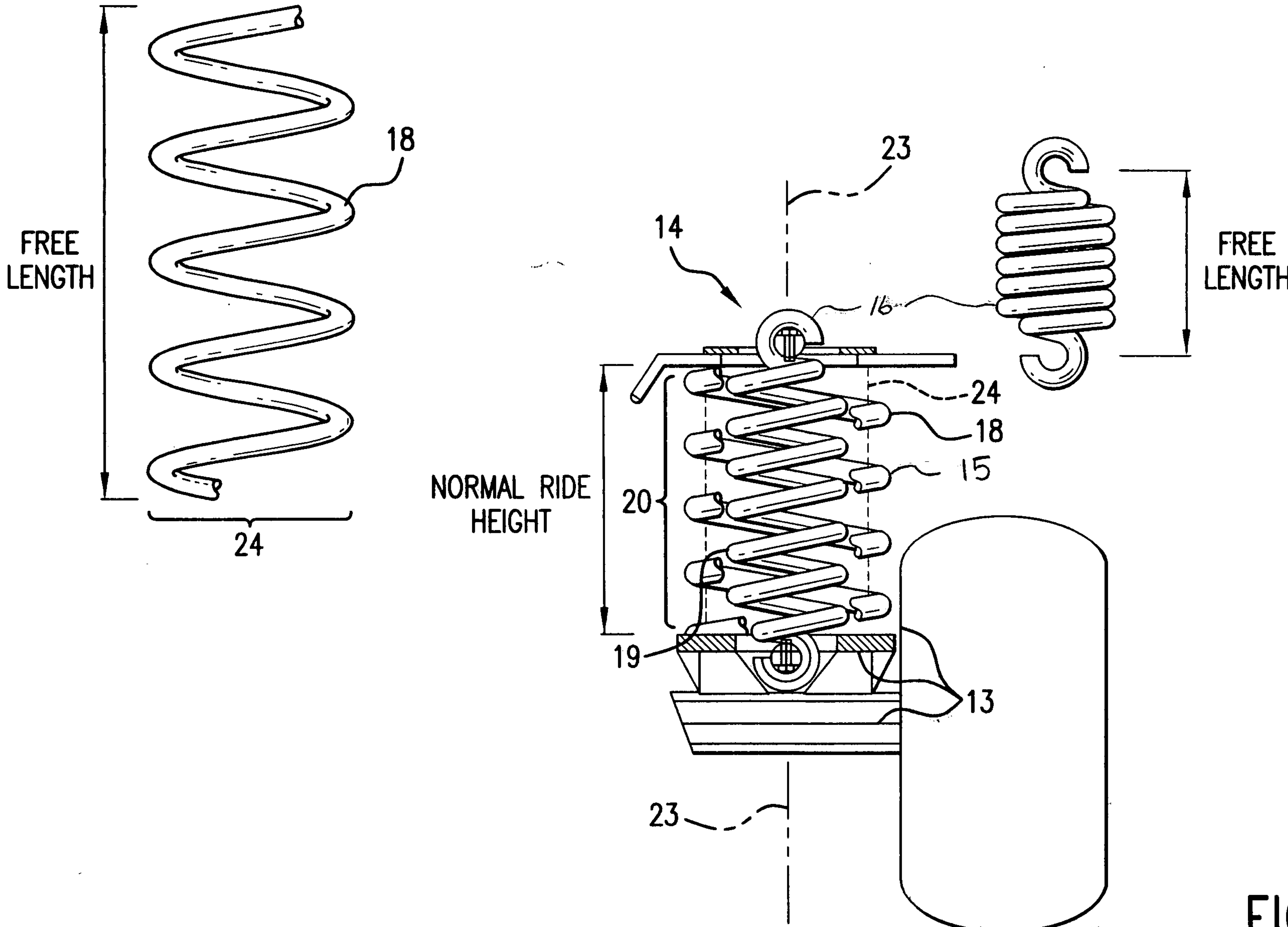
FREE
LENGTH
18
24
23
14
16
FREE
LENGTH
24
18
15
NORMAL RIDE
HEIGHT
20
19
13
23

FIG.3

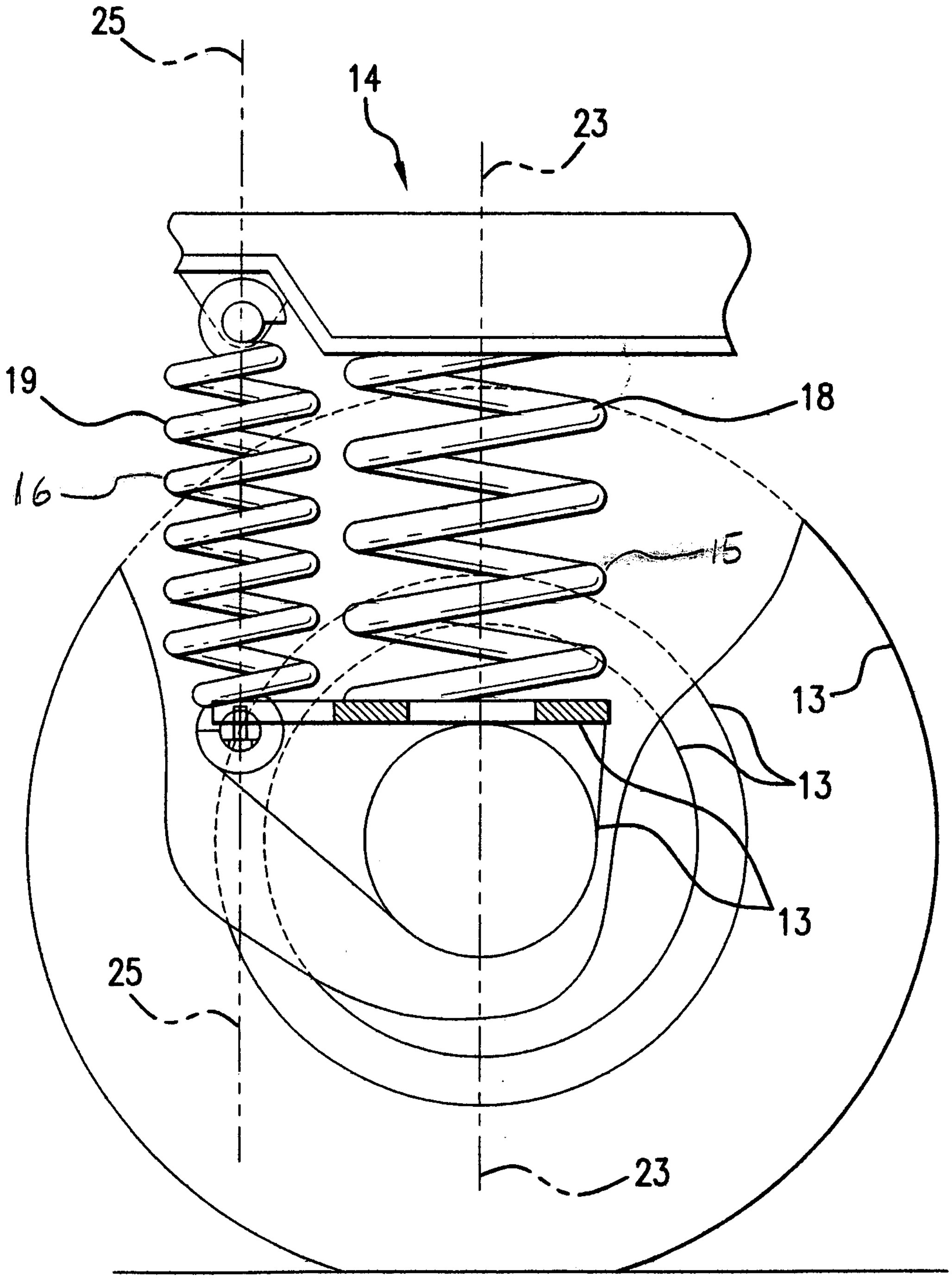

FIG.4

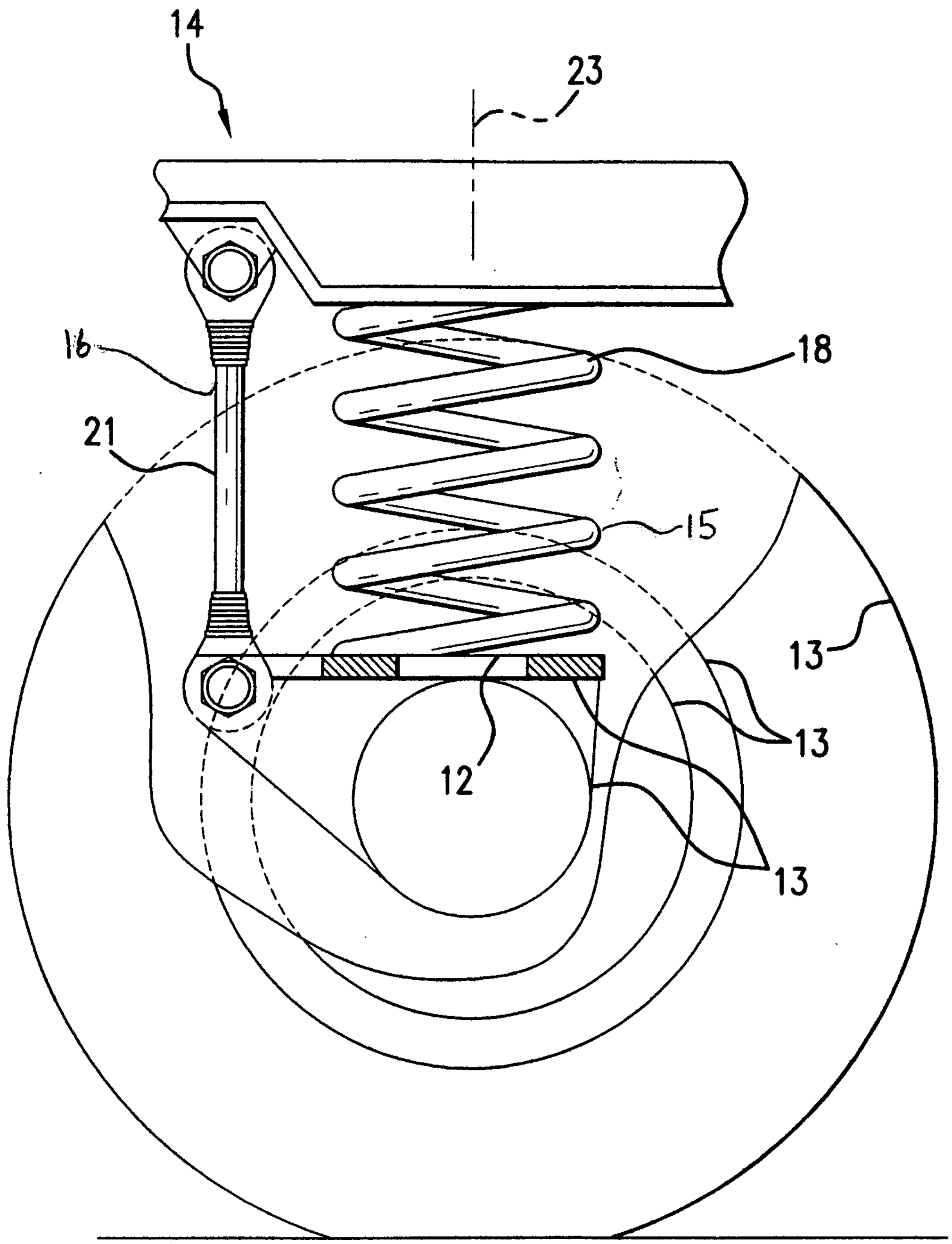

FIG.5

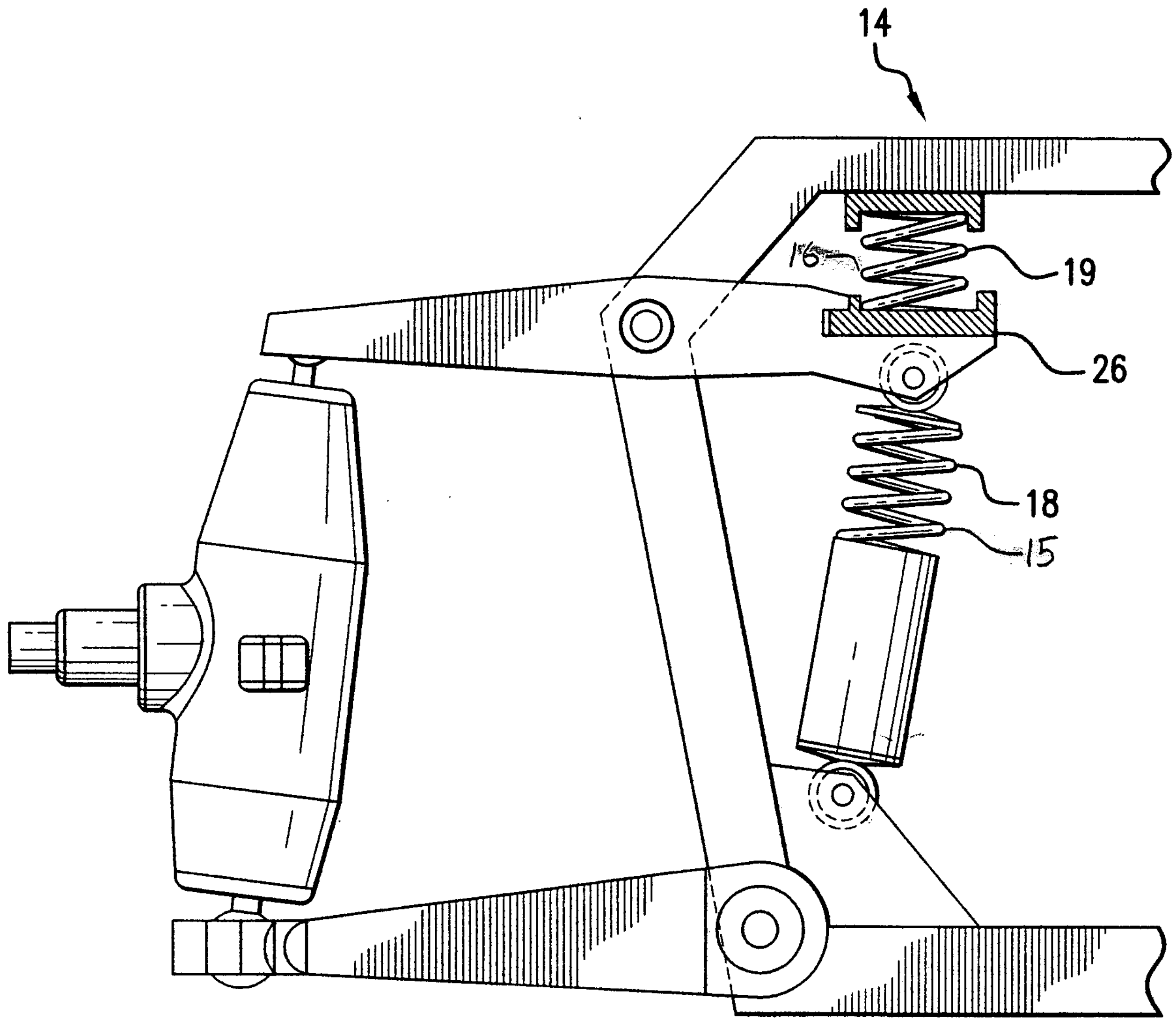

FIG.7

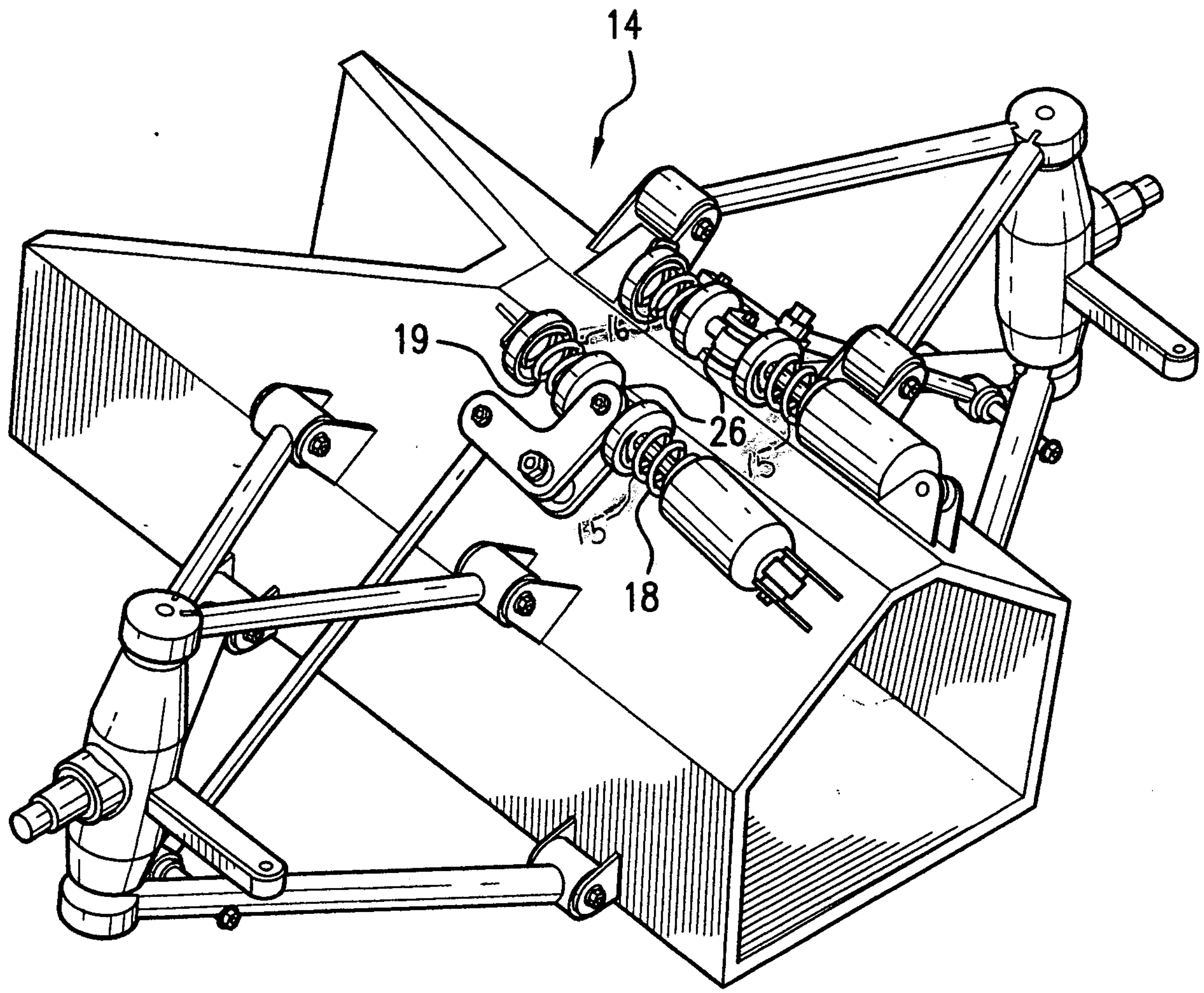

FIG.8

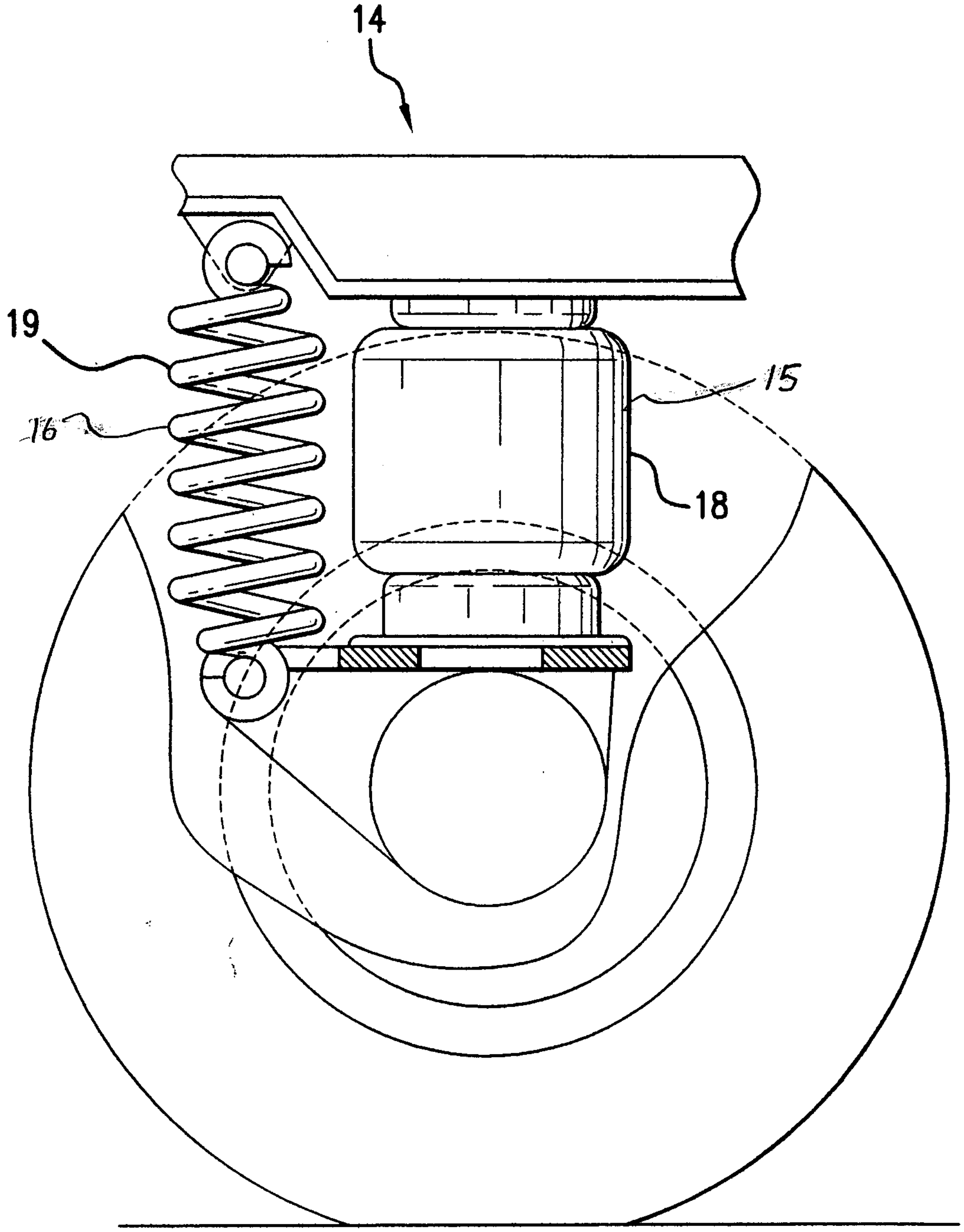

FIG. 11

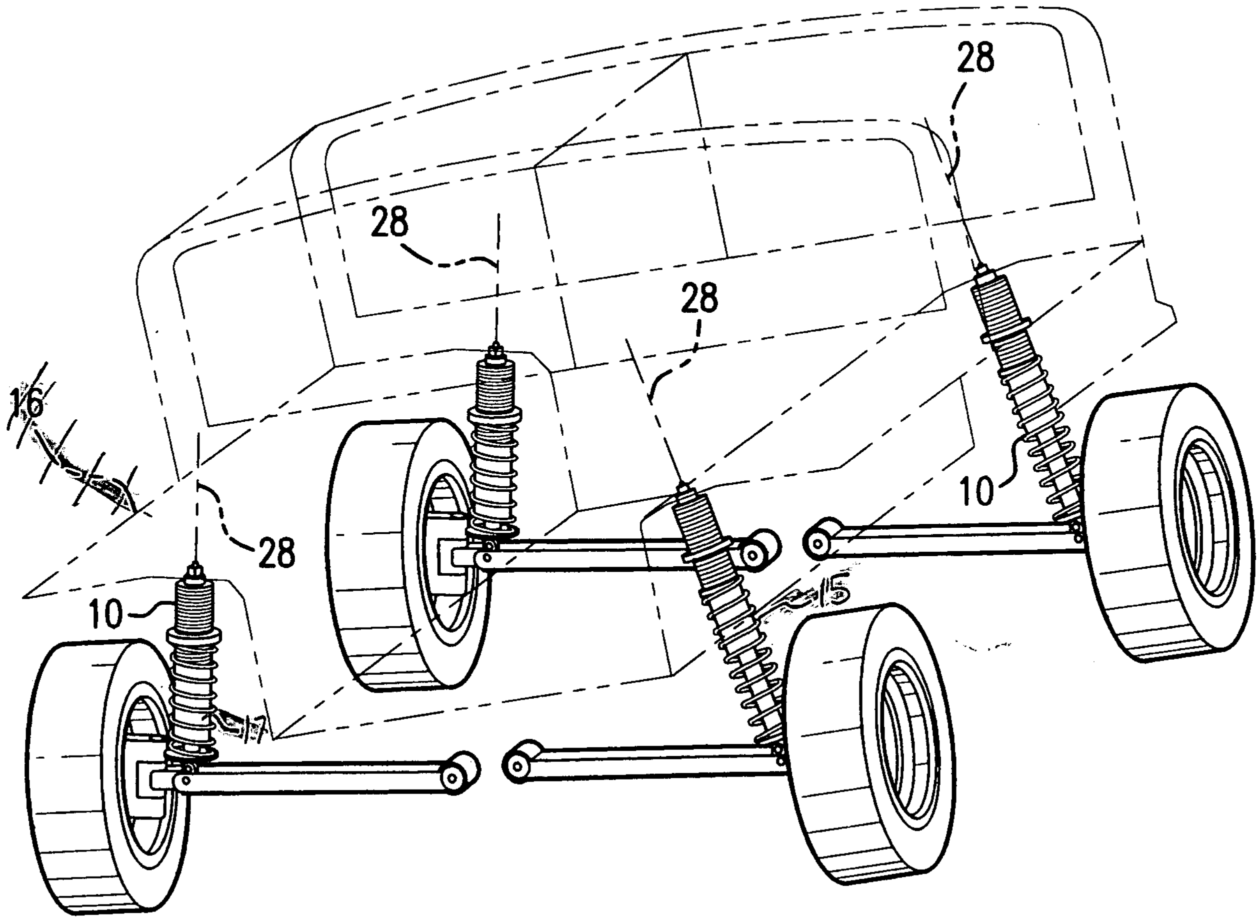

FIG. 12